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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/990,397	11/20/2001	Jung-Yu Hsieh	JCLA7289	2785

7590
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04/22/2002

EXAMINER

LEWIS, MONICA

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 04/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/990,397

Applicant(s)

HSIEH ET AL.

Examiner

Monica Lewis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 November 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 November 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

1. This action is in response to the application filed November 20, 2001.

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: a) 106' (See Page 2 Line 9). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.
4. The disclosure is objected to because of the following informalities: a) there are two "Summary of the Invention" headings (See Page 2 and 3); and b) "he" appears to be a spelling error (See Page 8 Line 13).

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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6. Claims 1 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Park (U.S. Patent No. 6,100,559).

In regards to claim 1, Park discloses the following:

- a) a tunneling oxide layer (15) located upon a substrate (12) (See Figure 1b);
- b) a floating gate (16a, 16b and 16c) located upon the tunneling oxide layer (See Figure 1b);
- c) a first oxide layer (14a and 14b) located upon the floating gate (See Figure 1b);
- d) a high dielectric constant dielectric layer (24) located upon the first oxide layer (See Figure 1b);
- e) a second oxide layer, located upon the high dielectric constant dielectric layer, wherein, together with the first oxide layer and the high dielectric constant dielectric layer, a dielectric stacked layer is formed (See Column 2 Lines 20-25);
- f) a control gate (26) formed on the second oxide layer of the dielectric stacked layer (See Figure 1b); and
- g) a source/drain region (13a and 13b) located in the substrate on the two sides of the floating gate (See Figure 1a).

In regards to claim 7, Park discloses the following:

- a) a tunneling oxide layer located upon a substrate (See Figure 1b);
- b) a floating gate located upon the tunneling oxide layer (See Figure 1b);
- c) a first oxide layer located upon the floating gate (See Figure 1b);
- d) a high dielectric constant dielectric layer located upon the first oxide layer, wherein, together with the oxide layer, a dielectric stacked layer is formed (See Figure 1b and Column 2 Lines 20-25);
- e) a control gate formed on the second oxide layer of the dielectric stacked layer (See Figure 1b); and

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f) a source/drain region located within the substrate on the two sides of the floating gate (See Figure 1a).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 2-6 and 8-13 are rejected under 35 U.S.C. 103(a) as obvious over Park (U.S. Patent No. 6,100,559) in view of Bui (U.S. Patent No. 6,163,049).

In regards to claims 2 and 8, Park fails to disclose the following:

a) a band gap value of the high dielectric constant dielectric layer is less than a band gap value of silicon oxide.

However, Bui discloses a dielectric layer composed of aluminum oxide, which has a band gap less than silicon oxide (See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Park to include an aluminum oxide as disclosed in Bui because it aids in maintaining the capacitance of the ONO film.

In regards to claims 3 and 9, Park fails to disclose the following:

a) a dielectric constant of the high dielectric constant dielectric layer is greater than 8.

However, Bui discloses a dielectric layer composed of aluminum oxide, which has a dielectric constant of 10 (See Column 4 Lines 29-36). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device

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of Park to include an aluminum oxide as disclosed in Bui because it aids in maintaining the capacitance of the ONO film.

In regards to claims 4 and 10, Park fails to disclose the following:

a) the high dielectric constant dielectric layer is a single layer including one material selected from the group consisting of Al_2O_3 , Y_2O_3 , $ZrSi_xO_y$, $HfSi_xO_y$, La_2O_3 , ZrO_2 , HfO_2 , Ta_2O_5 , Pr_2O_3 and TiO_2 .

However, Bui discloses a dielectric layer composed of aluminum oxide (See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Park to include an aluminum oxide as disclosed in Bui because it aids in maintaining the capacitance of the ONO film.

In regards to claims 5 and 11, Park fails to disclose the following:

a) the high dielectric constant dielectric layer is a layer including a mixed material any one selected from the group consisting of Al_2O_3 , Y_2O_3 , $ZrSi_xO_y$, $HfSi_xO_y$, La_2O_3 , ZrO_2 , HfO_2 , Ta_2O_5 , Pr_2O_3 and TiO_2 .

However, Bui discloses a dielectric layer composed of aluminum oxide (See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Park to include an aluminum oxide as disclosed in Bui because it aids in maintaining the capacitance of the ONO film.

In regards to claims 6 and 12, Park fails to disclose the following:

a) the material of the high dielectric constant dielectric layer is a stacked layer, each layer of the stacked layer including one selected from the group consisting of Al_2O_3 , Y_2O_3 , $ZrSi_xO_y$, $HfSi_xO_y$, La_2O_3 , ZrO_2 , HfO_2 , Ta_2O_5 , Pr_2O_3 and TiO_2 .

However, Bui discloses a dielectric layer composed of aluminum oxide (See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was

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made to modify the semiconductor device of Park to include an aluminum oxide as disclosed in Bui because it aids in maintaining the capacitance of the ONO film.

In regards to claim 13, Park discloses the following:

- a) a tunneling oxide layer located upon a substrate (See Figure 1b);
- b) a floating gate located upon the tunneling oxide layer (See Figure 1b);
- c) a control gate (See Figure 1b); and
- d) a source/drain region located in the substrate on the two sides of the floating gate (See Figure 1a).

In regards to claim 13, Park fails to disclose the following:

- a) an Al_2O_3 layer.

However, Bui discloses a dielectric layer composed of aluminum oxide (See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Park to include an aluminum oxide as disclosed in Bui because it aids in maintaining the capacitance of the ONO film.

Conclusion

9. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure: a) Lancaster et al. (U.S. Patent No. 5,644,533) discloses a flash memory system; b) Lee et al. (U.S. Patent No. 5,923,056) discloses a electronic components with doped metal oxide; c) Chan (U.S. Patent No. 5,933,729) discloses an ONO fence; d) Li et al. (U.S. Patent No. 6,087,696) discloses stacked tunneling dielectric dielectric; e) Hisatomi et al. (U.S. Patent No. 6,163,050) discloses a semiconductor device having insulation film.

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10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML
April 9, 2002



Michael Trinh
Primary Examiner